

DEP SPECIFICATION

PLANT TELECOMMUNICATION

DEP 32.71.00.10-Gen.

February 2011
(DEP Circular 47/11 has been incorporated)

DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for equipment and systems used for plant telecommunication and for the selection and specification of such equipment and systems.

This DEP applies to onshore plants (upstream or downstream) and is complementary to DEP 32.71.00.12-Gen. Telecommunications for offshore Platforms.

Reference in section (13) is made to a list of Shell and international standards for details of specific telecommunications subsystems.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual DEM 1 – Application of Technical Standards.

This DEP is a revision of the DEP with the same number dated July 1998; see (1.5) regarding the changes.

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification, distribution and supply/marketing. Application in other facilities may also apply.

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

1.3.2 Specific definitions

Term	Definition
Delegated Technical Authority	a person who has received delegated authority to approve Derogations from the Process Safety requirements from the Head of Shell P&T.
Derogation	an authorised variance or exemption from a Process Safety requirement, with specified conditions
Process Safety	the management of hazards that can give rise to major accidents involving the release of potentially dangerous materials, release of energy (such as fire or explosion) or both

1.4 ABBREVIATIONS

AC	Alternating Current
ANPR	Automatic Number Plate Recognition
ASCii	American Standard Code for Information Interchange
ATEX	ATmosphere EXplosibles (French – Explosive Atmospheres)
CCD	Charged Coupled Device
CCR	Central Control Room
CCTV	Closed Circuit Television
COS	Class of Service
DACA	Data Acquisition & Control Architecture
DC	Direct Current
DEP	Design Engineering Practice
DID	Direct Inward Dialling
DOD	Direct Outward Dialling
DSC	Digital Selective Calling
DTMF	Dual Tone Multi-Frequency
E1	European system of classifying ISDN bandwidth of 2 Mbit/sec
F&G	Fire and Gas
FAR	Field Auxiliary Room
GMDSS	Global Maritime Distress and Safety System
GPS	Global Positioning System
GST	Global Standard – Telecommunications
HF	High Frequency
HSSE	Health, Safety, Security and Environment
I/O	Input / Output
ICSS	Integrated Control and Safety System
IDS	Intruder Detection System

IP	Internet Protocol
ISDN	Integrated Service Digital Networks
LAN	Local Area Network
MDF	Main Distribution Frame
MPEG	Motion Picture Experts Group
NMS	Network Management System
NVR	Network Video Recorder
PABX	Private Automatic Branch eXchange
PAGA	Public Address General Alarm
PAS	Process Automation System
PC	Personal computer
PSTN	Public Switched Telephone Network
PTT	Post of Telephone and Telegraph
PTZ	Pan/Tilt/Zoom
SBM	Single Buoy Mooring
SDS	Short Data (messaging) Service
T1	American system of classifying ISDN bandwidth of 1.5 Mbit/sec
TCP/IP	Transmission Control Protocol/Internet Protocol
TDMA	Time Division Multiple Access
TER	Telecoms Equipment Room
TETRA	TErrestrial Trunk Radio
UHF	Ultra High Frequency
UPS	Uninterruptible Power Supply
UTP	Unshielded Twisted Pair
VOIP	Voice Over IP
VHF	Very High Frequency
VMD	Vehicle Motion Detection
VSAT	Very Small Aperture Terminal (satellite system)
WAN	Wide Area Network

1.5 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced by this DEP are listed in (13).

1.6 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated July 1998. The following are the main, non-editorial changes.

Old section	New section	Change
1		Updated
2		Updated
3.		Amended for new IP telephony
4.		Amended for new TETRA radio technology
5.		Updated
6.		Updated
	6.1	Added section on DACA
7.		Amended for new technology
8.		Amended to match CCTV sections
9.		Updated
10.		Updated
11		Updated
12		Updated
13	13	Added DACA DEP's and update international standards
	Appendix 4	Added DACA Appendix
14		Added SHALL [PS] statements
15		Segregated into specification and instruction DEPs

1.7 COMMENTS ON THIS DEP

Comments on this DEP may be sent to the Administrator at standards@shell.com, using the DEP Feedback Form. The DEP Feedback Form can be found on the main page of "DEPs on the Web", available through the Global Technical Standards web portal <http://www.shell.com/standards> and on the main page of the DEPs DVD-ROM.

1.8 DUAL UNITS

**Amended per
Circular 47/11**

Dual units have been incorporated throughout this DEP.

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

2. GENERAL

2.1 USER REQUIREMENTS

The safe and efficient operation of a plant generally requires:

- voice communication between the control room and operators at various locations in the plant;
- video monitoring of critical equipment and critical areas;
- voice, data and e-mail communication between control rooms, attached offices, workshops and laboratories;
- voice communication with on-site contractors, customs and government inspectors;
- entrance control, intruder detection and communication with security staff (usually data, video and voice);
- voice, data, fax and e-mail communication with the import and export terminals or facilities;
- voice broadcast and alarm communication to areas of the plant, particularly in emergency situations
- voice and pager communication with staff in residential areas;
- voice, data, fax and e-mail communication with the national 'main office' if this is not located within the plant boundary;
- voice, data, fax and e-mail communication with third parties, both nationally and internationally.

Plants that are heavily integrated with other facilities, e.g. gas gathering or distribution networks have additional user requirements and will require detailed advice from the Principal. Such plants may, for example, be designated as National Critical Infrastructure that requires telecommunications systems that are compliant with National guidelines for such installations

The telecommunication requirements for the construction of a plant, particularly on a 'green field' site, require special consideration since they are not the same as for normal operation.

2.2 TELECOMMUNICATION AUTHORITY

Contact with the Telecommunication Authority (usually a department or agency of Government) shall be made by the Principal for each project in which telecommunication is included.

In all cases it shall be assured that those systems that are connected to the public communication network and all systems based on radio transmission (plant radio, paging) have the approval of the Telecommunication Authority.

Regulatory authorities shall be informed and involved if extensive private communications systems are required for construction and later operation of the plant, (see DEP 32.71.00.31-Gen.).

Application to the Telecommunication Authority, for the necessary approvals, shall be made at the earliest opportunity.

2.3 SYSTEMS REQUIRED

The following systems or facilities are normally required:

- Telephone system with connection to the public network and Shell Group Network;
- Public Address General Alarm (PAGA) system;

- Plant radio system;
- Data system with connection to the Shell Group network;
- Emergency Communication Systems;
- CCTV system;
- Security and Intruder detection system;
- Access Control system

The following special telecommunication systems may be required:

- Communication for marine loading terminal and facilities;
- Communication for aircraft and helicopter operations
- Communication for gas gathering and/or gas distribution network;
- Temporary telecommunications systems for local, national and international communications for construction on 'green-field' sites;
- Extension of parts of the telecommunications systems outside the plant area to cover such as export pipelines

2.4 SYSTEM INTEGRATION

The separate telecoms systems components shall be integrated to create a complete operational system which meets the functional, integrity and availability requirements.

Prior to installation, the quality of the integration shall be assured by performing an iFAT (integrated Factory Acceptance Test) at the location of the integrator, to demonstrate that the system meets the functional, integrity and availability requirements.

3. TELEPHONE SYSTEM

The Telephone Systems design shall be based on hardware approved by the Principal to facilitate support by Company appointed third party network support contractor and shall be based upon GST-5065

Green field sites shall employ an IP telephony(VOIP) solution. Brownfield sites shall expand the existing telephone system or use an IP telephony solution integrated with the existing telephone system.

The following IP telephony sub-systems shall be provided:

- Wiring (to CAT 6 Standard);
- Call processor;
- Call Logging and Billing
- Voice recorder
- Voice Mail
- Firewall
- Wireless Access points
- IP telephone sets;
- IP Gateway providing connection to:
 - o The public network (PSTN)
 - o The Shell Group Network
 - o Legacy analogue telephones
 - o Fax Machines.
 - o Plant radio (e.g.TETRA)
 - o PAGA system

The IP Telephony sub systems are connected as shown in Fig 3.0

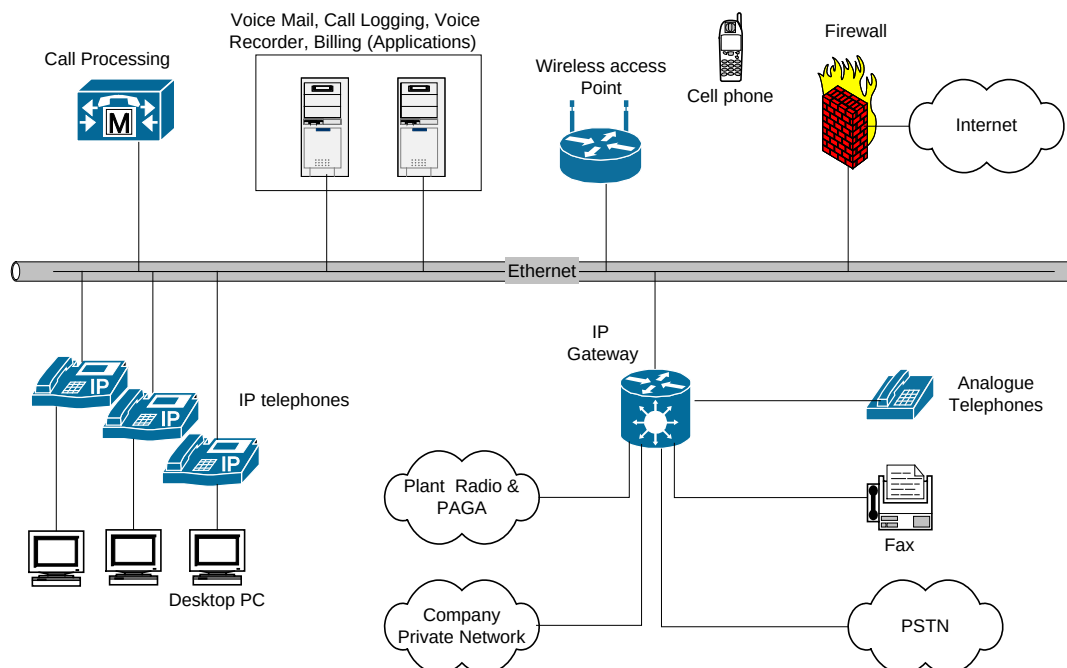


Fig 3.0 General arrangement of Plant IP telephone Network

3.1 WIRING

The following DEPs and GSTs shall be used in the design of cabling systems for:

- legacy wiring systems within the battery limits of oil, gas or chemical plants see DEP 32.37.20.10-Gen. Instrument Signal Lines
- office building wiring see DEP 32.71.00.30-Gen.; Structured cabling systems for telecommunications and GST-1008 – Structured Cabling Standard. Structured cabling systems shall be compliant with EIA/TIA 568 and ISO 11801 standards.
- residential areas and other off-plant locations see DEP 32.71.00.16-Gen. Design Installation of Telephone Cabling and GST-1008 – Structured Cabling Standard

3.2 IP TELEPHONE SYSTEM

GST-5015 IP Telephony Standard shall be used in the selection of IP telephone systems.

IP Telephony security shall be carefully considered as per GST-5075.

More details of the specification of an IP telephone system are given in (Appendix 1).

Only telephone systems with local Type Approval shall be considered. See (2.2).

3.3 TELEPHONE SETS AND PC CONNECTIVITY

The following types of telephone sets shall be considered:

- wire connected IP Telephone sets
- wire connected analogue or IP telephone sets ATEX approved for use in hazardous areas.
- Wire connected analogue telephone sets in combination with an A/D converter for IP use.
- wireless IP telephone set.
- Personal computer Based soft phones complying with GST-5080

It shall be clearly indicated where:

- each type of set has to be provided;
- additional features are required such as executive-secretary communications.

**Amended per
Circular 47/11**

Telephone sets installed in hazardous areas shall comply with DEP 32.31.00.32-Gen section 2.5.

Plant-mounted and portable telephones used in the plant, shall be suitable for explosive hazardous areas accordance with DEP 32.31.00.32-Gen section 2.11.

External bells/sounders shall be provided where the difference between normal ringtone volume and ambient noise is less than 6 dB.

In addition to bells/sounders, flashing beacons shall be provided where the ambient noise pressure level is more than 85 dB(A).

Telephone sets in control rooms and in the field shall be simple directly connect devices, without any requirements for logins, passwords, etc.

IP telephone system shall take CAT 6 cable length limitations into account. Where cable runs exceed CAT 6 limitations traditional analogue telephones and cables should be installed.

- 3.3.1 Wireless IP telephones offer the advantage of portability but all such sets SHALL [PS] be certified intrinsically safe for ATEX zone 1 IIC T4 as specified by IEC 60079-14. IP Telephone and PC installation.

A single Ethernet port shall be provided to connect both Telephone and PC as shown in Fig 3.0 with the PC connected to the network via a telephone Ethernet port. All IP telephones shall be equipped with two Ethernet ports to enable connection of both Telephone and PC as described above.

IP Telephone instruments shall be powered using power over Ethernet.

3.4 CONNECTION TO THE PUBLIC NETWORK

The IP telephone system SHALL [PS] be designed for direct connection to the public network without operator intervention so that direct inward and outward dialling is technically possible from any extension. Interface to the PSTN shall be via redundant IP gateways. Extension class of service will determine the ability of a phone to connect to the PSTN.

The local telephone company should be consulted about the interface required for connection to the PSTN. The preferred connection is E1 (2 Mbit/sec or 30 traffic channels) or multiples of E1 depending on the number of extensions that will be accessing PSTN lines. T1 service may be offered in North America and some other countries.

3.5 BACK-UP FACILITIES

IP telephone systems shall provide internal redundancy by having separate but linked independent call processing units running in mirrored configuration.

The IP telephone sub systems SHALL [PS] be supplied from a UPS with sufficient capacity to run the telephone system with full traffic for at least 8 hours in the event of mains power failure.

The following alternative means of communication shall be provided in the event of a telephone system fault:

- direct outgoing telephone lines by-passing the plant telephone system;
- direct lines (hot lines) to the local community Emergency Services and to utility companies;

Mobile (GSM phones) or Direct satellite telephones shall be provided where the above alternatives are not possible.

4. PLANT RADIO SYSTEM

Plant size shall be considered for very small plants, a radio system consisting of a main station in the control room and a number of handheld radios all operating on a single radio frequency will provide adequate coverage, or the area can be served by wider area coverage.

For larger facilities, a digital trunked radio system to TETRA as per EN 303 035 or equivalent standards shall be selected.

The trunked radio and paging system (if required) shall provide radio coverage on the facility between:

- Handportable to handportable radio
- Handportable to fixed radio
- PBX (telephone system) to handportable and fixed radios
- PBX (telephone system) to pager receivers

The number of handheld radios that are needed will depend on the operating philosophy of the plant. The frequency band chosen shall follow frequency plans as determined by local and international regulatory bodies.

4.1 TRUNKED RADIO

A typical arrangement for a plant Trunked UHF radio system is shown in fig 4.1

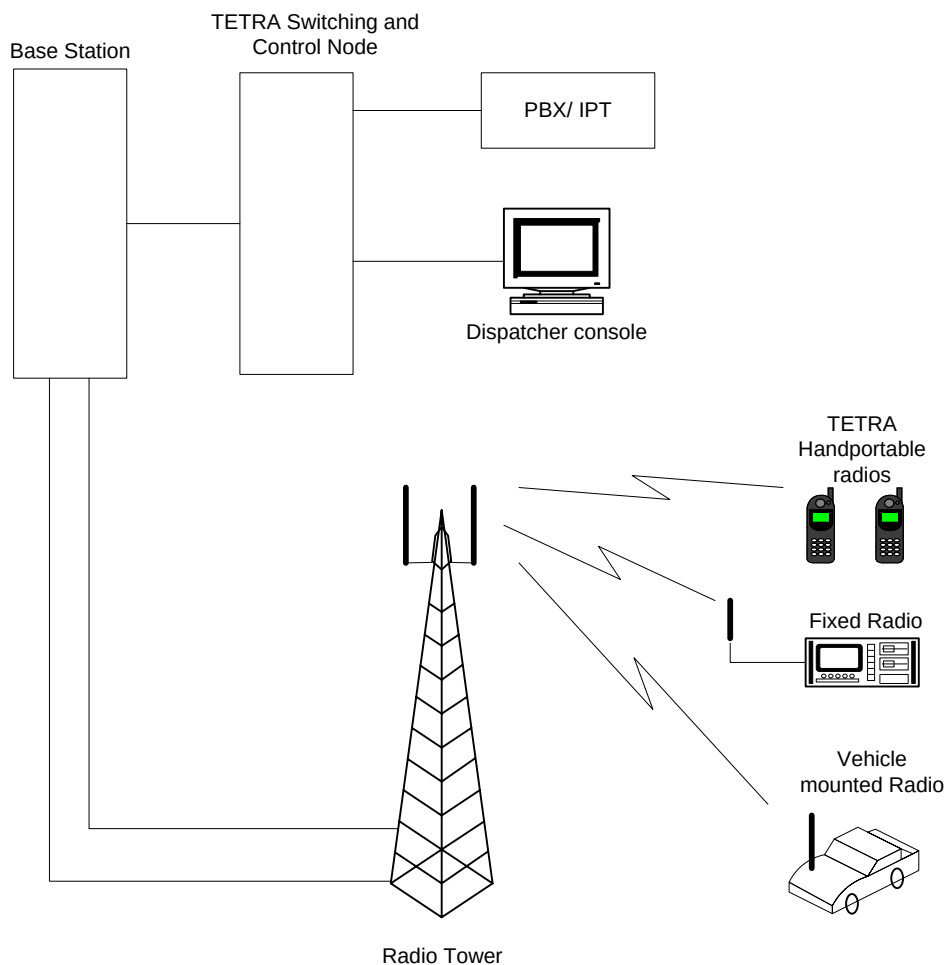


Fig 4.1 General arrangement of trunked (TETRA) plant radio system

The system shall include a multi channel UHF Trunked (e.g.TETRA) radio base station located on the facility close to the radio tower, providing facility wide radio coverage.

The system shall be equipped with multiple carriers providing full duplex logical channels. One channel is used for system control, leaving other channels for communication. The system supplied shall be capable of expansion to accommodate additional carriers and channels.

Short data (messaging) service (SDS) shall be provided.

An integrated trunked switching and control node shall be supplied that handles call processing.

The air interface should use a standard signalling protocol based on international standards, e.g. ETSI EN 300392 Voice plus data (V+D) or other equivalent standard.

Each base station shall have a stand-by transceiver. Switchover from one set to the other may be carried out manually.

The switching and control node assigning the channels shall have its own specific redundancy built in.

Each user group shall have one or more radio dispatcher consoles that should be capable of being placed at operational locations within the plant.

A radio operator console consisting of a handset or microphone, loudspeaker and push-to-talk button shall be provided in the central control room and should be provided at every operator position. Alternatively, separate loudspeakers may be considered, in which case the volume of both speakers shall be individually adjustable, and the system shall be designed such that there is no acoustic feedback.

4.2 LOCATION AND ANTENNA

The radio equipment and associated antennas should be located in a position to give optimum coverage of the plant. A telecommunications tower may be required. See DEP 32.71.00.14-Gen. for guidance on tower design. If it is not possible to provide reliable coverage from a single location, one or more repeaters should be considered. For coverage inside buildings, tunnels or areas shaded by steelwork, leaky coaxial cable may be used.

4.3 INTERFACE WITH THE TELEPHONE INFRASTRUCTURE / SYSTEM

The plant radio system shall be connected to the telephone system allowing automatic access to a radio channel by telephone.

Access to a radio channel shall be limited to selected extensions only, based on class of service (COS). Design of the interface shall ensure that telephone access has the lowest priority and does not block access to a radio channel by other users.

4.4 FIXED RADIOS

Fixed radio terminals, including antennas, feeder cables, lightning arrestors and externally mounted antennas shall be provided in selected areas of the facility.

The following locations on a facility shall normally be supplied with fixed radio terminals:

- CCR consoles
- Plant manager and supervisors offices
- Security gatehouse
- Emergency control centre
- Fire station control room
- Medical centre
- FARs
- Jetty Operations and loading facilities

Fixed radio terminals that are required during emergencies such as those located in the control room, emergency control centre, fire station and jetty & loading facilities, shall be powered from vital power supply as per DEP 33.64.10.10-Gen section 3.9

4.5 HANDPORTABLE RADIOS

A single standard type of handportable, including its dedicated battery shall be adopted throughout a plant area.

Handportable radios for use in plants SHALL [PS] have a type of protection "EX-i" (intrinsically safe), and be certified to "EX-i" Zone 1 IIC T4" or more stringent, as specified in IEC 60079 ;in some areas this may be the equivalent FM (Factory Mutual) specification. The handheld radios shall be fit for purpose without being over complicated to operate. All handportable radio equipment shall be equipped for a minimum of sixteen workgroup operation, and protected from water and dust ingress to IP65 as defined in IEC 60529.

Each handheld radio shall be provided with:

- high capacity battery
- Spare battery
- Battery conditioning charger unit
- Leather carry case
- Belt
- Lapel speaker/microphone

Provision of suitable headset should also be considered for high noise areas.

Charging units shall be provided at all locations where handheld radios are kept. The battery chargers should be capable of "rapid" charging. Radio batteries are expensive and if there are a significant number of radios (say 20 or more), a computer based battery charging and management system should be considered together with spare batteries.(as an alternative to individual chargers)

Approximately 10%, additional spare handheld radios shall be supplied.

4.6 VEHICLE RADIOS

The plant radio system should be used only for communications within the plant boundary. If required selected plant vehicles may be equipped with UHF handportable radio hands free car kits.

4.7 POWER SUPPLY

The Base station and TETRA switching and control node SHALL [PS] be power supplied from vital power as per DEP 33.64.10.10-Gen section 3.9

For fixed radio terminals see (4.4)

4.8 NETWORK MANAGEMENT SYSTEM (NMS)

A network management system that provides the following shall be provided:

- configuration;
- monitoring; and,
- data logging facilities.

The NMS terminal shall be located in a manned location, such as a network control centre.

The NMS system shall have the following functionality: